



A PROGRESSIVE ROADMAP FOR EXPANDING EUROPEAN DIGITAL SOVEREIGNTY

ABSTRACT

This policy brief outlines an ecosystemic and progressive roadmap for strengthening Europe's digital sovereignty, understood as an international endeavour that goes beyond simply expanding access to digital technologies. It argues that digital sovereignty, defined as the democratic control by states and their people of essential technologies for their lives and self-government, also requires the capacity to understand and develop technologies with full awareness of their environmental, social, economic, ethical and political implications.

Building on this definition and recognising that digital value chains are dominated by US and, to a lesser extent, Chinese Big Tech companies, the policy brief calls for the creation of a public-led, democratic, and people-centred digital value chain or stack that operates within planetary boundaries. It sets out why such an alternative ecosystem is both necessary and achievable, and why the public sector should take the lead by establishing democratic, public institutions to govern it.

As the policy brief concludes, more than ever, we need technologies that empower people and respect the planet, prioritising these goals over private profit, military objectives, and the geopolitical ambitions of a small minority that undemocratically wields global power. Whether the European Union will rise to this challenge remains an open question.



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A different and better digital future is possible. The EU can digitalise in its own terms by putting public interests, users, the climate and healthy competition central.

”

Dr Cecilia Rikap

1. Introduction

Every economic, social and political interaction today relies on digital technologies that are disproportionately provided by companies from the USA and, secondarily, China. Effects are felt far and wide throughout Europe and the rest of the world, from economic dependence to security risks. This system hijacks democracy at multiple levels: artificial intelligence (AI) nudges foster overconsumption, algorithmic management disciplines workers and replaces creative tasks at the expense of critical thinking, while disinformation is promoted by social media's addictive AI algorithms and AI can even be granted with military decision-making power.¹ Collectively, these major problems are the expression of a system controlled by a few corporate giants in an increasingly close alliance with their respective governments.

US Big Tech's power over global capitalism has been further strengthened by its open alliance with the current US government, as evidenced on the inauguration day of Trump's second presidency when the tech “broligarchy” enjoyed the spectacle from their front-row seats. Big Tech hopes this alliance will afford it Trump's protection against foreign regulations and a halt to US government actions targeting it. The US government's insistence on deterring the EU

from enforcing AI and other digital regulations (e.g., the Digital Services Act) should be understood as an outcome of this alliance.

Meanwhile, the US government gets a chance to **weaponise the world's digital dependence**. Concrete examples are actions against the International Criminal Court (ICC): the ICC's work was completely paralysed after Microsoft complied with the US government's request to close the court's account on its services.²

Big Tech companies have previously served the US government's hegemonic aims, including through Google, Apple and Facebook's provision of data access to the US National Security Agency for global surveillance.³ But unlike this clandestine partnership, today's US corporate-political coalition is celebrated openly, evidencing the crisis of a democratic system in which the state was supposed to be democratically governed and serve citizens' needs, but instead, ended up privileging a corporate minority.

Another difference from the past is that Big Tech's power today goes far beyond its control over social media and personal data. Several US large tech companies have “chokepoint power”⁴ in key segments of digital technologies' value chain, such as Nvidia in the design of AI semiconductors, that enable them to garner sustained and substantial intellectual rent.⁵ More importantly, Amazon, Microsoft and Google concentrate not only specific segments and resources – such as fundamental platforms, data centres, datasets and AI talent for developing models – but virtually control, beyond ownership, the whole AI and other digital technologies' value chains. They steer these value chains' priorities and extract value from thousands of participating organisations. These three giants dictate everything from the

conception of new technologies to the operation of digital markets.⁶

Amazon, Microsoft and Google are unique because they dominate the cloud: the space where digital technologies are produced, exchanged and consumed. Together, and in that order, these giants control around 65% of the global public cloud computing market, with an even higher share in some countries.⁷ Their clouds host multiple interconnected markets where thousands of players interact. Yet the number of participating actors – both selling and buying – does not make the space competitive because they follow rules – both when exchanging and developing solutions – dictated by these three Big Tech firms. Seen as the single space for developing and adopting technologies that are crucial to our societies and economies, companies of all sizes – and even states – are increasingly compelled to become locked-in cloud clients.

The AI boom has only strengthened their dominance, and they are poised to remain at the top, investing billions more in cloud infrastructure.⁸ **As AI becomes widely adopted and emerges as a method of invention and creation, Big Tech's power continues to grow.** Virtually all generative AI startups today rely on them. The cloud has become indispensable for training and deploying AI models.

Existing alternatives, notably adopting Chinese technology, would replicate dependences and risks. Chinese “Big Tech” (e.g., Baidu, Alibaba and Tencent) operates with the same predatory practice, pushing the industry to develop the same type of control technologies preferred by the American giants. They also coincide in terms of their alliance with their respective governments. The US Big Tech's proximity to the Trump administration was mirrored in China. Even Alibaba's founder, Jack Ma, participated in

a gathering with Xi Jinping on 17 February 2025, ending years of distance from the government.

Overall, both American and Chinese models of Big Tech and state collaboration aim to exert global hegemonic power through controlling information and essential technologies: they are both based on knowledge and data predation from universities, public organisations and companies spread across the world.⁹ They also advocate for a widespread adoption of AI and other digital technologies, regardless of their social, economic and ecological implications.

As a result, there is an urgency to produce an alternative that overcomes the severe reduction of (digital) sovereignty for both states and people, as recognised by the European Parliament. Different groups of scholars and civil society activists have also joined forces to suggest road maps and concrete policy recommendations for expanding digital sovereignty outside the USA and China, with some efforts particularly focused on Europe.¹⁰ Their common denominator is the need to have democratic states that are fit for leading an alternative to value chains controlled by Big Tech, centred around the imperative to advance digital sovereignty for building a just society in which humans live in harmony with nature.

However, we still see insufficient efforts from the European Commission to adequately address the nature of digital dependences. **The AI Continent Action Plan is based on incorrect diagnostics at both the macro- and microeconomic levels and will thus fail to deliver a true alternative to Big Tech.** The proposal places hope on AI-driven competitive gains, but productivity indicators fail to show that part of the productivity of the USA is value captured from the rest of the world. Productivity indicators also overlook the social and ecological effects of economic activities, and thus, cannot be the only ones

to be considered in policymaking. The second misunderstanding at the macro level is that the idea of massive productivity increases driven by the adoption of AI are not verified empirically. In fact, macroeconomic productivity gains driven by AI adoption are expected to be less than 0.53% over the next decade.¹¹

From a micro or industry perspective, what is needed is not only physical infrastructure and talent, as recognised in the AI Continent proposal, but **also to replace Amazon, Microsoft and Google clouds as the central space where, as mentioned above, digital technologies are not only produced but also exchanged, shared and consumed.** This requires creating an alternative digital value chain or stack guided by the following four principles:

- 1) **Public-led:** digital technologies are different from every other type of technology. Their centrality for economies, democracy and the planet requires building an alternative in which the space for developing, exchanging, sharing and consuming solutions is not a Big Tech cloud but a public and democratically governed digital economy, with public physical infrastructure and public platforms for essential functions (such as the development of new solutions, open-source foundational models and architectures, and public marketplaces). Offering such an alternative stack will expand states' capacities to secure sovereignty for people and the planet.
- 2) **Democratically governed:** the governance of such an ecosystem should neither be captured by corporate interests nor by state surveillance or techno-nationalisms.¹² It should be based on the principles of open science and open source for fundamental underpinning technologies on top of which marketplaces with private solutions could

be developed. In this alternative ecosystem, governance and regulatory mechanisms to prevent the private capture of open solutions should also be developed.

- 3) **People-centred:** prioritised technologies should improve people's lives and working conditions, including through the provision of better public services. A public-led stack should confront today's ecosystem – which promotes rivalries, polarisation and individual gains – with digital technologies that are designed for promoting the socialisation of gains and knowledge to expand the common good, while introducing strict regulations on what data can be harvested and used for training AI models.
- 4) **Within planetary boundaries:** overwhelming evidence on the environmental harms of unrestricted development and adoption of AI amid the ecological breakdown requires putting the planet ahead of what actually are exaggerated productivity promises.¹³ To this end, clear priority uses should be identified and limits to unnecessary uses must be put in place.

Based on these four principles, it is possible to expand **digital sovereignty, which is understood as the democratic control by states and their people of essential technologies for their lives and self-government.** In what follows, I build on these principles to suggest concrete recommendations that shall be seen as preconditions for expanding sovereignty in Europe in a democratic, environmentally responsible and economically viable way.

2. Preconditions for expanding digital sovereignty

2.1 Towards a public-led digital stack¹⁴

Key messages

- Breaking Big Tech's dominance requires the creation of alternative spaces to develop, exchange and commercialise digital technologies. Existing initiatives like the AI Factories Action Plan and Gaia-X are insufficient, as they do not address the root causes of dependency.
- Europe must adopt a new paradigm in which search engines, online marketplaces and AI foundation models are considered digital public utilities, reflecting their importance to the economy and society.
- Developing a public-led digital stack can expand the EU's digital sovereignty and bring the development and production of digital technologies under democratic control.
- Streamlined public sector procurement can serve as an engine for this public-led digital stack with additional financing through measures like levies on the extraction of free data by large platforms.

Europe should build an alternative public-led digital ecosystem that serves the public sector, people and the planet. It should replace Big Tech bottlenecks and their panopticon power,¹⁵ with open knowledge and democratic platforms engendering an ecosystem that offers technologies that can expand states' digital sovereignty.

Such an alternative must neither emulate Big Tech's extractive ecosystem nor promote

techno-nationalisms that only care about the origin of the solutions instead of transforming their very nature and effects. **Expanding sovereignty requires not only using but also producing digital technologies, democratically deciding what technologies are developed and for what.** For this purpose – and considering that network effects and economies of scale contribute to economic concentration in specific segments of the digital stack – **a public-led digital stack or value chain requires:**

- 1) **public physical infrastructure;**
- 2) **a marketplace for computing services;**
- 3) **open-source foundation models and platforms;**
- 4) **a digital technologies R&D agency** focused on frontier science and technology that will feed into the whole value chain, and
- 5) **public sector procurement** to assure demand, and thus, contribute to the success of this alternative model.

A reason why Big Tech's clouds have become so dominant is because they rent storage and processing power as infrastructure as a service (IaaS). Transforming what would otherwise be a risky and high fixed cost into a variable cost is particularly tempting for small organisations. The expansion of the start-up ecosystem is therefore closely tied to the availability of cloud services, where organisations pay only for the storage, processing power and other computing services they use, such as platforms, software and data. Start-ups thus become perpetual rent payers, with their entire business models dependent on Amazon, Microsoft or Google clouds. Among them, because frontier AI models are generally built by renting from their clouds

IaaS, are companies like OpenAI, Anthropic and Mistral.

Offering an alternative space for developing digital technologies is, therefore, crucial. However, by themselves, **data centres** like the European Commission's proposed "**AI factories**" will not replace reliance on Big Tech's clouds. While AI factories replace the cloud as IaaS, they do not replace Big Tech's clouds as the marketplaces where every digital technology is sold and consumed. Even companies developing AI foundation models with their own processors, such as DeepSeek and Meta, then depend on Big Tech's clouds to sell them as a service. This is why a public-led digital stack or value chain should also include a **marketplace** for both selling and freely sharing computing services. From sophisticated AI models to specific software and applications, IaaS could be sold and shared in such a marketplace.

Replacing Big Tech's chokepoint on physical infrastructure and the panopticon power it enjoys through its cloud marketplaces **cannot be replaced with purely decentralised solutions**, such as Gaia-X, an initiative to develop a federated secure data infrastructure for Europe. They are less convenient for users and require more capabilities than those needed to simply rent services on the cloud. Big Tech's clouds are a "single digital territory" for producing, sharing, exchanging and consuming digital technologies. They offer convenience and a solution especially for small businesses. The convenience is extended to the fact that organisations need to follow and learn to comply with only a single set of rules. Conversely, the drawback is that they end up integrating a space where the rules are those of Big Tech and where their actions are subordinated and part of their profits are siphoned by these giants. Only Amazon, Microsoft and Google control who knows what and who does what inside these virtual

territories. A public-led stack should therefore replace this undemocratic concentration of decision-making power and oversight with a truly public, open space.

For this alternative ecosystem or value chain to flourish and to keep fundamental knowledge open, foundational platforms must be offered as public services and should remain open source, enabling everyone to build applications and other specific solutions on top of them. This shall include platforms that offer essential services to be considered as **digital public utilities**: search engines, e-commerce marketplaces, AI foundation models and social media have become essential infrastructure of today's societies. Their centrality for the economy and democracy, and the tendency to generate winner-takes-all dynamics, push for open, democratic alternatives to existing extractive platforms and models. In the public-led stack, these platforms and foundation models should be a commons, governed by new public institutions with state, union and civil society representation.

A public-led stack will thus offer actors of every size and specialisation all the necessary layers for enabling the development of specific solutions in what should be a **competition layer** of the public-led stack. This competition layer could include open source, collaboratively developed services offered for both free and proprietary applications. As long as they are in compliance with established regulations and environmental standards, every computing service shall be granted the possibility to be part of this layer.

Such an ecosystem could initially be promoted for providing services for a specific sector, such as healthcare or education. In that case, the specific competition layer would offer services targeted for that vertical and the open

AI foundation model to be developed should be tailored to that sector.

Dedicated public funding should be used to encourage the open-source community to develop specific services identified as gaps or missing in the public-led stack. Exploratory, on-demand funding should also be available for concrete proposals on how to improve the public-led stack and make it more sustainable.

A dedicated **digital technologies R&D agency** should be established to develop and regularly update the necessary architecture of the public-led stack, including its foundation platforms and cybersecurity software. R&D on AI and other digital technologies must find a space independent of the networks controlled by Big Tech and other corporate giants. This agency should promote public knowledge networks focused on an independent research agenda that is not driven by the hype or pressures of technological solutionism, but instead develops science and technology, taking into account their economic, political, ecological, and ethical priorities and implications.

Building frontier models requires hundreds of scientists working together on long-term projects, which is an additional reason for establishing a non-profit international research institution dedicated to producing digital technologies for people and the planet. The experiences of CERN or the French INRIA (National Institute for Research in Digital Science and Technology) can serve as inspiration for the creation of this agency, albeit with some key differences. Besides integrating leading scientists and engineers, such an agency must include researchers from the social sciences and humanities in sufficient numbers, ensuring that their insights into the economic, political, social and environmental impacts of digital technologies, particularly AI, are taken into

account from the outset: when deciding what models to develop, how and using which data. Another difference from existing public research organisations will be the close relationship with the rest of the value chain. This digital agency should have regular dialogue with the publicly owned organisations managing both physical infrastructure and the public marketplace, as well as with the final users of the technology – such as hospitals or schools – to collectively identify priorities.

Finally, for this alternative ecosystem to succeed, member states must guarantee that they will be the primary users of the public-led stack. **Public procurement** of digital products and services should be exclusively channelled through this public-led stack. This would assure demand and could be used by member states as a lever to guide the development of digital technologies towards social and environmental goals.

At least part of the funding for such an initiative could be drawn from taxing Big Tech's appropriation of data and knowledge. Several options could be explored, from digital services taxes to levies on the extraction of free data by large platforms. Leading corporations must also pay fair and adequate income taxes. Nevertheless, the costs of building such an alternative would be substantial, making international or regional operation the most viable approach. An international solution would also help to reduce environmental impacts since more users will adopt the same solution. As a public, autonomous and regional initiative, this public-led stack would also help mitigate the risks of state surveillance and safeguard against attempts by specific governments to dismantle it. In this regard, the EU should also promote international efforts to enforce an **agreement stating that the use of digital technologies for surveillance, targeting and**

extermination against their citizens and those beyond their borders is strictly forbidden.

Policy recommendations:

- Develop a public-led digital stack that encompasses solid public digital infrastructure, a marketplace for computing services and open-source AI foundation models and platforms.
- Establish a dedicated digital technologies R&D agency to foster long-term and interdisciplinary scientific collaboration to develop and maintain the technological architecture of the public-led stack.
- Centralise EU- and member-state-level public procurement of digital products and services through the public-led stack to ensure adequate demand.
- Explore the feasibility of establishing additional revenue sources, such as a tax on digital services and levies on the extraction of free data by large platforms.

2.2 Governance, competition and power

Key points

- The public-led stack should have a democratic governing body, which is publicly funded but autonomous and has a mandate to prioritise communities and planetary good.
- While promoting competition across all layers of the stack is a step in the right direction, this will not offer a definitive solution to the several layers of the stack being prone to natural monopolisation.

- This problem is further compounded by the fact that many of the natural monopolies operate within networks or ecosystems, rendering traditional solutions to abuses of economic power ineffective.
- Competition policy needs to evolve to take into account networks and ecosystems as relevant units of analysis and, conceiving power abuse, the possibility to exercise a chokepoint effect or hold a panopticon view across a digital system.

Designing **democratic governing bodies** for a public-led stack is a complementary way to reassure that this solution will not be turned against people and democracy. Such a governing body could be publicly funded but remain autonomous and have a mandate to prioritise communities and planetary good. Trade union representatives and independent civil society organisations should be included in the public-led stack governing body, alongside elected representatives from the R&D agency and contributing governments. This democratic governing body should periodically replace all its members, but replacement shall be done at different points in time to guarantee its stability and the transmission of experience.

Such a multi-stakeholder governing body should remain independent from corporate powers and their allies to ensure democracy and sovereignty. It should also use digital technologies to sense and contemplate people's interests so that research and innovation priorities can take them into account. Such democratic deliberation should be extended to the broader discussion about what type of AI should be developed, by whom and for what purpose, thus **offering a counterweight to the Big Tech promoted discourses of AI as a one-size-fits-all solution**. This discussion must also account for AI's ecological footprint. While AI

models can be widely applied, alternatives that are less resource intensive should be prioritised whenever possible.

An alternative to developing a public-led stack could be to foster competition in all its layers. However, **promoting competition will not offer a solution in the case of several segments of the digital stack because they are prone to natural monopolisation.** In these cases, a single firm is more efficient than two or more providers due to economies of scale and could even represent a lower environmental impact than what would result from an unrestricted market expansion. This scenario requires solutions that are neither the current degrees of unregulated control by a few giants nor unsuccessful attempts to promote competition.

Search engines are an apparent example of when a single firm can be more efficient than multiple different ones. Several search engines for asking the same type of questions would be less efficient than one, as users would need to consult several platforms to find the best answer. Also, both in search engines and other AI-powered services, algorithms improve through use, resulting in dynamic economies of scale and powerful network effects that reinforce the natural monopoly. **It becomes nearly impossible to privately challenge decades of algorithmic refinement and data accumulation.** These are reasons to conceive key digital services, such as foundation AI models, search engines and social media, as public utilities. Another reason they should be seen as public utilities is **because AI algorithms are endlessly improved with our prompts, which means that society at large is collectively co-producing them.**

An additional problem with these natural monopolies is that they operate within networks or ecosystems. **Pursuing traditional antidotes to economic power abuses, such**

as monopolists' break ups, will at most be an incomplete solution. A Big Tech firm could be forced to divest assets and break up, as currently discussed for Google in the USA,¹⁶ but the new companies will most likely remain under its control. Divested companies can still work together, sharing databases and research results to maximise rent extraction. There are plenty of cases of formally detached companies that still share data. Microsoft and OpenAI shared intangibles for developing ChatGPT, while, in China, Alibaba and Ant Group are legally separated but continue to cross-reference datasets to strengthen each other's businesses. The same could happen with the firms resulting from a split up of Google. **The main flaw in the divestment hypothesis lies in its failure to account for the fact that firms operate within (asymmetric) ecosystems and production networks, sharing information selectively.** This is not to say that divestments should not occur, but to emphasise that they cannot be seen as the main, let alone only, policy solution to economic power abuses.

To fully account for economic power in today's capitalism, **competition policy** should evolve from being narrowly focused on individual markets towards considering **networks or ecosystems as the relevant unit of analysis.** Consequently, power abuses could instead be conceived as the capacity to exercise a chokepoint effect or hold a panopticon view of the system.¹⁷ Within networks, especially digital ones, information and knowledge inequalities underpin economic asymmetries. Big Tech and other large tech companies are intellectual monopolies that use their position in those networks to capture data and knowledge produced collectively and turn it into their rent-bearing intangible assets.

For all these reasons, rather than competition, the alternative for those segments of the digital

stack that are prone to natural monopolisation, as well as to intellectual monopolisation in the public-led stack, should remain public and open. A democratic public-led stack can be seen as a form of countervailing power to intellectual monopolisation, as long as it socialises knowledge and learning. Precisely, **a public-led stack is not opposed to competition because, by offering a public alternative to Big Tech ecosystems, competition layers can be promoted and remain decentralised in the rest of the system,** as explained above. In addition, and because a public-led digital stack will not fully replace Big Tech, but only offer an alternative, **Europe must enforce its existing and enact new regulations.**

Policy recommendations¹⁸

- Establish democratic governing bodies for each of the public institutions and public enterprises that will collectively run the public-led digital stack.
- Require Big Tech and other giants to **share data extracted from Europe.** A public institution could be created as their steward, which could operate as a **Data Agency** that also grants access to publicly held data to those from the public sector working on projects that should remain public and open. All these datasets should be used only for public research and policy on a principle of data solidarity, in which citizens are clearly informed and requested to grant permission for use of their data.
- Create an obligation to share data in the case of public procurement where every company contracted by the public sector must share with it all the data harvested as part of providing the service in an editable format.

- Provide the state with a **golden share¹⁹** in the affiliates of large digital corporations operating in Europe. Such a golden share will expand chances to supervise the deployment of new services, audit algorithms ex ante and request compliance with local regulations.
- To limit knowledge extractivism, institutions receiving European funds should commit to not accepting Big Tech funds or services for their research and innovation.
- Push the United Nations to foster an **assessment and redefinition of digital technology standards** aimed at reversing large tech companies' use of standard setting to impose their technologies.

2.3 Empowering people and communities

Key messages

- Technologies should address common problems and contribute to bridging asymmetries within Europe. Expanding digital sovereignty also means shaping the trajectory of digital technologies.
- Integrating Europe should not mean imposing the same technology on every European but empowering Europeans to make informed decisions.
- International cooperation is crucial for expanding digital sovereignty since knowledge expands when it is shared. Collective solutions are cheaper, likelier to succeed and more environmentally friendly.
- The case of healthcare data illustrates how collective data sharing can generate benefits that are unlikely to emerge from a market-

based data economy. With appropriate governance and regulation, centralised healthcare data could play a crucial role in managing the global health care crisis.

Expanding digital sovereignty through a public-led, international, ecological and democratic alternative should not only aim to remove technological, economic and even political control from the hands of Big Tech and place it within democratic, international institutions. It is **equally important to shape the trajectory of digital technologies so that they serve collective needs and wants of the population while respecting planetary boundaries**. Technologies should address common problems and contribute to bridging asymmetries within Europe.

Among these asymmetries, expanding internet access and digital technologies should certainly remain a political priority. However, pursuing digital inclusion within the current system would represent an expansion of data subjects for Big Tech and other large platform companies. **This is why proposals such as digital IDs, e-payments or a European data exchange platform should be developed only and to the extent that they can be hosted at state-owned data centres** and always offering citizens the possibility to opt-out from those platforms. Integrating Europe should not be synonymous with imposing the same technologies on every European, but instead should empower Europeans to make informed decisions about which technologies they want to use, for what, when and how.

Addressing the digital divide between a majority that uses technologies and a minority that controls the digital ecosystem and concentrates associated profits also requires going beyond the usage of digital technologies and internet access. **The main global digital divide today is between the global majorities and the few**

that know how technologies work and decide which ones are produced and how. Because only this minority retains the whole oversight of the system, they decide the future of the most ubiquitous technologies of our time, ultimately deciding how societies learn and what they learn about.

For expanding digital sovereignty, the EU must therefore build capacities to **steer the development of science and technology and ensure that everyone can not only use but also access, understand and produce digital technology with full awareness of their environmental, social, economic, ethical and political implications**. This is why international cooperation is crucial for expanding digital sovereignty since knowledge expands when it is shared. Collective solutions are cheaper, more likely to succeed and more environmentally sustainable.

Collaboration at the EU level for negotiating better deals for essential segments of the digital value chain that are not produced within the region is another example of required cooperation that will strengthen Europe's integration while deactivating potential bottlenecks in the development of an open and democratic alternative. This is particularly the case for AI semiconductors. While there is little chance of catching up with Nvidia for their design or with TSMC for manufacturing them, at least in the short and mid-term, **collective buying** for the public-led stack, as well as for European universities and other organisations aiming to purchase AI processors, could be a way to partially mitigate Europe's disadvantage.

Digital technologies are also data hungry. Europe could further deepen its integration by developing **data pools and associated common solutions** for applying digital technologies to areas where these technologies can generate

significant social gains, such as the centralisation of anonymised electronic healthcare records and other healthcare data. Resulting datasets should be governed according to the principle of **data solidarity**: a conscious, democratically informed commitment to sharing data between actors and across borders for the common good.²⁰ Data solidarity can only work if citizens are clearly and transparently informed about what data is being collected, the authorised uses and who will have access to it.

The case of healthcare data illustrates how collective data sharing can generate benefits that are unlikely to emerge from a market-based data economy where individuals or organisations sell their data to different companies, without reaching the scale enabled by a public, commons-based solution. **With appropriate governance and regulation, for instance, building on the safeguards included in the European Health Data Space, centralised healthcare data could play a crucial role in managing pandemics and other global health crises, while also informing strategies to improve population wellbeing.** Cross-referencing healthcare data with socio-economic and environmental datasets – and analysing them through digital technologies – could provide evidence to enhance prevention, diagnosis, treatment and care delivery.

These and other collective solutions should be explored beyond Europe, at the international level. The scale of investments required coupled with the ecological impact of a new digital ecosystem make a strong case for developing joint solutions with other regions. Initiatives such as harmonised regulations or agreements on minimum digital or data taxes are further examples of efforts that could be pursued collaboratively, aiming at building a digital stack that prioritises social and planetary gains over systems that deepen economic inequalities and undermine democracies.

Policy recommendations

- The EU must steer the development of science and technology and ensure that everyone can use, access, understand and produce digital technologies with full awareness of their environmental, social, economic, ethical and political implications.
- Proposals such as the digital ID should be developed only and to the extent that they can be hosted at state-owned data centres.
- Better collaboration at the EU level: negotiating better deals for essential segments of the digital value chains and collective buying in the case of AI semiconductors could be a way to partially mitigate Europe's disadvantage.
- Europe can deepen its integration by developing data pools and associated common solutions for applying digital solutions. Collective solutions should be explored at the international level, beyond Europe, too.

2.4 Digital sovereignty as a catalyst for a just transition²¹

Key messages

- The strategic development of certain applications of digital technologies could contribute to a coordinated just transition.
- Big Tech companies' paid solutions for ecological breakdown not only slow the transition because those that should adopt them need to agree on paying for them, but also reduce the likelihood of effectively addressing the crisis by promoting individual actions as the primary path to sustainability.

- Applying AI for social and environmentally beneficial purposes should remain an international commons since the urgency of the ecological crisis requires that every government implements them regardless of their capacity to afford them.

International collaboration within and beyond Europe is also crucial for designing a coordinated just transition that overcomes the ecological crisis. Coordination so far has been insufficient, and too much hope has been placed on the role of markets for solving what needs to be a coordinated global effort.

The strategic development of certain applications of digital technologies could contribute to such efforts. However, in the ecological crisis, Big Tech companies have found a source of profits and a way to further entrench their power over society and states. **They have developed AI and other cloud services based on extracting data from the planet and nature that are sold as essential for addressing the ecological breakdown.** An example is Google Earth, a platform with datasets full of images of Earth that are crunched with algorithms co-developed with universities and public research organisation that are then sold as cloud computing services on Google cloud.

Those purchasing green cloud services never access complete datasets or the code of the services provided, so only Big Tech keeps the panopticon view of nature while making a business by renting pieces. This strengthens their intellectual monopolies by positioning their digital solutions as the linchpin of the transition.

Resulting asymmetries in terms of access to environmental information and knowledge must be reverted. Governments around the world should work together to access a

comprehensive global oversight of nature. The proposed digital technologies R&D agency could develop and continuously update a **digital inventory of nature** that, together with existing initiatives, such as DestinE, should be used for more effective ecological policymaking.

Such an inventory could be used, for instance, for predictive maintenance of natural parks since using computer vision and other AI models could improve wildfire predictions and inform on the best species of trees to be planted according to the type of soil and forest. **Applying AI for these and other social and environmentally beneficial purposes should remain an international commons since the urgency of the ecological crisis requires that every government implements them regardless of their capacity to afford them.**

Big Tech companies' paid solutions for ecological breakdown not only slow the transition because those that should adopt them need to agree to pay for them, but also reduce the likelihood of effectively addressing the crisis by promoting individual actions as the primary path to sustainability. **This approach is grounded in the narrative that consumers are responsible and must make different choices, thereby deflecting attention from corporate responsibility, especially the vast consumption of electricity, water and minerals by Big Tech itself.** It also diverts the conversation away from acknowledging that their clouds enable other companies to outsource their ecological footprint, diminishing their accountability for their consumption of common goods. Their ongoing AI hype encourages overconsumption of models and other services, placing even greater strain on an industry already exerting substantial environmental pressure.

UNCTAD showed that electricity consumption by the major data centre operators increased around 150% between 2018 and 2022,²² and the IMF indicated that all data centres combined were already consuming more electricity than France and could surpass every country in the world with the exception of China, the USA and India by 2030.²³ **Although Big Tech companies try to reduce their data centre emissions by using renewable electricity, their massive demands still pose problems, as using electricity for AI reduces the amount available to decarbonise in other urgent areas like transport and heat.** Besides, part of their use of renewables comes in the form of renewable energy certificates from locations that are far from their data centres, so they still consume fossil fuels to run them.²⁴ A strategy to consume less electricity is the use of water to cool down server temperatures, which has led to rising water demands. In 2022, Microsoft's water use grew 34% and Google's 22%.²⁵

Prioritising an effective solution for the ecological crisis requires making tough but necessary political decisions that will represent economic losses for these and other companies. This is a reason why only states can lead in the development of a strategy that can adequately address the ecological breakdown and social inequalities. **A just transition also requires that the application of AI and other resource-intensive solutions remains limited to socially necessary uses for which alternatives that are less harmful for nature are not available.**

These solutions could be complemented with the promotion of low-tech implementations of digital technologies that require the consumption of fewer resources where possible and by promoting the digital solidarity economy through privileged funding and access to public and open digital tools, encouraging their federation and interconnecting universities

and non-profit organisations so that they can share their digital resources and initiatives, thus reducing the overall consumption of electricity, water and other common goods.

There is also an urgency for arriving at **international common standards and regulations for data centres**, including where they can(not) be installed and minimum quality standards in terms of the materials and technologies to be used to minimise their environmental impact. Such minimum sustainability requirements should also consider the effects on the population living close to where data centres will be installed. More generally, international cooperation is necessary for minimising digital technologies' overall ecological impact.

Policy recommendations

- Governments around the world should work together to access a comprehensive global oversight of nature. Asymmetries in terms of access to environmental information and knowledge must be reverted.
- A just transition requires that the application of AI and other resource-intensive solutions remains limited to socially necessary uses for which alternatives that are less harmful to nature are not available.
- Develop international common standards and regulations for data centres: where they can be installed, minimum quality standards and technologies to be used, taking into consideration the effects on the local population.

3. Conclusion

In a world increasingly torn apart by antidemocratic policies and uses of technologies, in which the chances of overcoming the ecological crisis look bleak and international cooperation dwindles, Europe has a unique window of opportunity to create a bold alternative that contributes to addressing all these major drawbacks: a public-led, democratic and people-centred digital stack that respects planetary boundaries and privileges digital technologies that can improve communities and nature. More than ever, we need technologies that are good for people and the planet and that put these goals ahead of private profits, the military and geopolitical aims of a minority that undemocratically rules the world.

The US and Chinese Big Tech dominated ecosystems constitute a race against technological supremacy that ultimately chooses to strategically ignore the social and ecological implications of AI and other digital technologies. Together with other allied regions, Europe could counterbalance these models with a digital ecosystem that opposes those giants' intellectual monopolies with public physical infrastructure and public, open-source and common solutions. On top of them, countless specific services could be developed and sold precisely because the scaffolds of the ecosystem will remain public and accessible to everyone. In such a public-led system, organisations will be able to participate on an equal basis, sharing and co-creating technologies for a better present and future for all.

Such a public-led digital ecosystem is also indispensable for advancing a just transition. The idea of the twin transition overlooks four fundamental questions:

- 1) Who is producing (green) digital technologies, and who is capturing their associated profits?
- 2) What is the environmental cost of developing those digital solutions, and thus, their potential to end up worsening instead of contributing to solving the ecological breakdown?
- 3) What type of digital technologies are being developed beyond those seen as green digital technologies and to what extent are they needed given their environmental pressures?
- 4) What are the effects of the control exerted by a few giants in terms of global inequalities?

Placing these questions at the centre of the debate about which technologies to develop and how to develop them is essential for building a public-led international, ecological and democratic digital stack. Creating this alternative is feasible, but it demands political courage to rethink prevailing models of statecraft and to challenge dominant narratives that portray public-led solutions as inherently undemocratic, insufficiently qualified or stifling innovation. Europe is characterised by high-quality public research and innovation from its diverse network of public institutions. Building on this network is crucial for assuring the necessary capabilities for developing a public-led stack.

Now is the time to build digital sovereignty for people and the planet.

Box 1: Policy examples to learn from

To build a more effective, environmentally sustainable and cheaper alternative to Big Tech's dominated ecosystem, countries should learn from each other. The examples offered below are not a comprehensive list but offer inspiration for policymaking in Europe.

Policy examples to learn from

- **ANTEL** is Uruguay's main telecommunication company. It is state owned and was responsible for developing the digital infrastructure which now assures that 94% of Uruguayan households have internet access. ANTEL also provides fibre-optic internet to 99% of all those households. The current Uruguayan government's [political program](#) includes transforming ANTEL into a digital company that will store public sector data and provide digital services to the state.
- The UK Competition and Markets Authority has launched a [trial programme](#) that uses an AI-powered tool that scrapes and analyses large datasets to identify bid-rigging – collusion – in public procurement.
- Aware of the pervasive impact of digital technologies on every social and economic aspect and the need to share information and collaborate on topics related to digital markets and platforms, Canada created the "[Canadian Digital Regulators Forum](#)". It is an integration of the Canadian Radio-Television and Telecommunications Commission, the Competition Bureau, the Office of the Privacy Commissioner of Canada and the Copyright Board of Canada.
- In 2024, Brazil's Supreme Court [required X to suspend user accounts](#) that had instigated the 8 January 2023 capital riot. X's refusal

to obey led Brazil's Supreme Court to rule in favour of the interruption of X. After the ban, X changed its network provider on 18 September, resulting in a temporary restoration of service. Brazil's Supreme Court reacted by imposing a daily fine of almost \$1 million, prompting X to move back to its previous network provider the following day. Finally, X began to comply with some of the Court's demands and the service was eventually reestablished. The case shows, to date, the boldest action to enforce the law against large tech companies and should be seen as an example for all authorities that have raised fines for violating data protection and consumer protection policies around the world, from the EU to Nigeria, which is currently litigating against Meta for its abusive practices.

- The Chilean government has developed a digital tool that maps almost 80 socio-environmental indicators and regulations for every square kilometre in Antofagasta, one of the country's regions, with plans to expand the initiative nationwide. The mapping tool will be used to assess suitable locations for installing data centres, ensuring that they are not placed in socio-environmentally sensitive areas. The government is open to sharing the tool with other governments, and it can be adapted to map other regulations and indicators to support territorial planning and relocation of other industries.
- The Buenos Aires provincial government in Argentina was among the first to levy a tax on digital services. Its [2019 Tax Law](#) included digital services provided by non-residents within the taxable event for the Gross Income Tax. While the tax remains relatively low, with a cumulative revenue of \$14.5 million between 2021 and 2024, it sets a precedent for national and local

authorities aiming to levy digital taxes. Since its implementation, other provinces in Argentina have introduced a similar tax. The most recent one was Santa Fé. Its digital tax was implemented on 1 July 2025.

- Big Tech decoupling:
 - Dozens of scholars from the University of Groningen have [signed a petition](#) to terminate their university's contracts with Big Tech. This type of initiative can make university administrations keener on exploring alternatives while raising the awareness of students and communities.
 - Local governments are moving away from Microsoft technologies. This includes the German state of Schleswig-Holstein, which has decided to run on open-source technology, and two Danish cities – Copenhagen and Aarhus – have also moved away from Microsoft Office.
 - In Denmark, the Minister for Digital Affairs has committed to end contracts with Microsoft Office and replace it with open-source solutions.

Other examples to learn from are those that have put the ecosystemic nature of this sector at the heart of building alternatives:

- The [Fediverse](#): this is an alternative, decentralised network of mostly free and open-source applications. Its main limitations include a comparatively less user-friendly experience and the fact that it only aims to replace certain layers of the stack, particularly social media and social networks directly rivalling X, YouTube and Meta's platforms. This means that they cannot be seen as an alternative digital

stack in themselves, but they could certainly integrate a public-led stack.

- The Estonian public sector is a pioneer in data exchange across the government's administration through [X-Road](#), its distributed and open-access data exchange platform. It was developed by the Nordic Institute for Interoperability Solutions and consists of a set of protocols and authentication codes that enable the exchange of information over the internet between connected servers, while simultaneously verifying requests for information contained in registered databases. However, just like other so-called digital public infrastructure, X-road by itself does not replace the ecosystem controlled by Big Tech. It nonetheless contributes to the operations of the public sector; it is open source, secure and interoperable. It could therefore play a relevant role in a public-led stack.
- Brazil's Pix: [Pix](#) is an instant payment system developed and managed by the Central Bank of Brazil. It was broadly adopted by the population but eventually became integrated into Google Wallet. This example underscores the need for a comprehensive, systemic or networked approach that reaches the whole digital stack. Without such an approach, individual or isolated platforms risk being absorbed into Big Tech ecosystems or, as in the case of the Fediverse, remaining relatively marginal.

Endnotes

- 1 US Big Tech companies' procurement contracts with the US Department of Defense and other federal agencies have multiplied by four in the last decade. Yet, unlike previous forms of the US industrial-military complex, Big Tech business does not depend on these contracts and even the US military has become structurally dependent on their monopolised technologies. Coveri, A., C. Cozza and D. Guarascio (2024) "Blurring boundaries: An analysis of the digital platforms-military nexus. *Review of Political Economy*, 1–32. DOI: 10.1080/09538259.2024.2395832; Rikap, C. (2024) "The US national security state and Big Tech: Frenemy relations and innovation planning in turbulent times". *Review of Keynesian Economics*, 3(12): 348–364. DOI: 10.4337/roke.2024.03.06
- 2 Caraballo, A. (2025) "[International civil society's tech stack is in extreme danger](#)". *The Dissident News*, 19 May.
- 3 Greenwald, G. and E. MacAskill (2013) "[NSA Prism program taps in to user data of Apple, Google and others](#)". *The Guardian*, 7 June.
- 4 The term refers to bottlenecks that occur when a company or a few companies dominate a critical segment of a value chain. In political science, the exercise of a chokepoint effect refers to a state using the privileged position of its companies to prevent other countries from participating in the value chain or at least condition their participation. Farrell, H. and A. L. Newman (2019) "Weaponized interdependence: How global economic networks shape state coercion". *International Security*, 1(44): 42–79. The concept was then mobilised to explain how corporations themselves could directly exercise chokepoint power by conditioning the whole value chain – its participants, the distribution of profits and the overall direction of the chain. Rikap, C. (2024c) "Varieties of corporate innovation systems and their interplay with global and national systems: Amazon, Facebook, Google and Microsoft's strategies to produce and appropriate artificial intelligence". *Review of International Political Economy*, 6(31): 1735–1763. DOI: 10.1080/09692290.2024.2365757
- 5 Intellectual rent refers to the extra profit earned from the use and commercialisation of intellectual property.
- 6 Jacobides, M. G., S. Brusoni and F. Candelon (2021) "The evolutionary dynamics of the artificial intelligence ecosystem". *Strategy Science*, 4(6): 265–445. DOI: [10.1287/stsc.2021.0148](#); Rikap, C. (2024) "Varieties of corporate innovation systems and their interplay with global and national systems: Amazon, Facebook, Google and Microsoft's strategies to produce and appropriate artificial intelligence"; Rikap, C. (2024) "[Dynamics of corporate governance beyond ownership in AI](#)". *Common Wealth*, 15 May; Rikap, C. and B.-Å. Lundvall (2021) *The Digital Innovation Race: Conceptualizing the Emerging New World Order* (Cham: Palgrave Macmillan); van der Vlist, F., A. Helmond and F. Ferrari (2024) "Big AI: Cloud infrastructure dependence and the industrialisation of artificial intelligence". *Big Data & Society*, 1(11). DOI: 10.1177/20539517241232630
- 7 In its cloud investigation, OfCom estimated that the three companies' market share could be near 80% in the UK.
- 8 Hodgson, C. (2023) "[Tech giants pour billions into cloud capacity in AI push](#)". *Financial Times*, 5 November.
- 9 Lundvall, B.-Å. and C. Rikap (2022) "China's catching-up in artificial intelligence seen as a co-evolution of corporate and national innovation systems". *Research Policy*, 1(51): 104395; Rikap, C. and B.-Å. Lundvall (2021) *The Digital Innovation Race: Conceptualizing the Emerging New World Order*.
- 10 [Time to build a European digital ecosystem, EuroStack report, Reclaiming Digital Sovereignty](#) etc.
- 11 Acemoglu, D. (2025) "The simple macroeconomics of AI". *Economic Policy*, 121(40): 13–58.
- 12 While every country should be entitled to expand its digital sovereignty, technological races that foster rivalries neither favour democracies nor their citizens. In a particularly challenging geopolitical context, democratic governments should aim at working together to build a democratic alternative to Big Tech systems. Building national value chains instead would not only be more expensive and worsen the digital ecological

impact, but it would also risk ignoring that certain parts of digital, and in particular AI, value chains are prone to natural monopolisation. As a result, they would inevitably lead to concentrated corporate power, regardless of their nationality, recreating predatory systems along the lines of China's experience. Lundvall, B.-Å. and C. Rikap (2022) "China's catching-up in artificial intelligence seen as a co-evolution of corporate and national innovation systems"; Rikap, C. and B.-Å. Lundvall (2021) *The Digital Innovation Race: Conceptualizing the Emerging New World Order*.

13 At the micro level, while AI may increase individual productivity for some jobs given its impact on specific tasks, such as time spent on emails (Dillon, E. W., S. Jaffe, N. Immorlica et al. (2025) "[Shifting work patterns with generative AI](#)". Working paper 33795. National Bureau of Economic Research, May), it also adds new tasks to several jobs (Humlum, A. and E. Vestergaard (2025) "[Large language models, small labor market effects](#)". Working paper 33777. National Bureau of Economic Research, May).

14 This section in particular, as well as some of the proposals included in the following focus areas, are further developments of those included in the report on [Reclaiming Digital Sovereignty](#).

15 Amazon, Microsoft and Google oversee global capitalism. They have a unique capacity to make economic inferences about all the organisations that have migrated to their clouds by analysing their consumption of digital services. These companies can also track and steer the specific evolution of the whole AI research and innovation network given their direct and indirect connections with all the other participating organisations. Rikap, C. (2024) "Varieties of corporate innovation systems and their interplay with global and national systems: Amazon, Facebook, Google and Microsoft's strategies to produce and appropriate artificial intelligence".

16 Morris, S. and S. Palma (2025) "[US to demand Google break up its online advertising business](#)". *Financial Times*, 2 May.

17 Lianos, I. and B. Carballa-Smichowski (2022) "A coat of many colours—new concepts and metrics of economic power in competition law and economics". *Journal of Competition Law & Economics*, 4(18): 795–831; Rikap, C. (2024) "Varieties of corporate innovation systems and their interplay with global and national systems: Amazon, Facebook, Google and Microsoft's strategies to produce and appropriate artificial intelligence".

18 The following set of suggestions is a selection of recommendations included in the report on [Reclaiming Digital Sovereignty](#).

19 A type of share of stock that lets its owner outvote all other shareholders under certain circumstances.

20 Kickbusch, I. and B. Prainsack (2023) "Against data individualism: Why a pandemic accord needs to commit to data solidarity". *Global Policy*, 3(14): 569–572. DOI: 10.1111/1758-5899.13222

21 This section is based on the academic article "A green transition orchestrated from Big Tech clouds?", currently in press at Globalizations.

22 UNCTAD (2024) "Digital Economy Report 2024. Shaping an environmentally sustainable and inclusive digital future". United Nations.

23 Bogmans, C., P. Gomez-Gonzalez, G. Melina et al. (2025) "[AI needs more abundant power supplies to keep driving economic growth](#)". IMF Blog, 13 May.

24 "[Big Tech's bid to rewrite the rules on net zero](#)". *Financial Times*.

25 Criddle, C. and K. Bryan (2024) "AI boom sparks concern over Big Tech's water consumption". *Financial Times*, 25 February.

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